

(EEAP) LIGHTING SURVEY STUDY

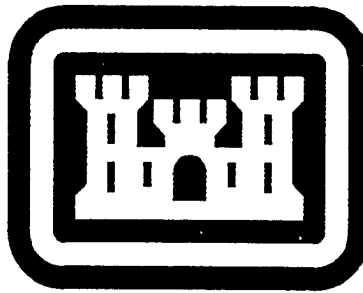
AT THE

RED RIVER ARMY DEPOT

TEXARKANA, TEXAS

FINAL REPORT

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**US Army Corps
of Engineers**

Fort Worth Division

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CONSULTING ENGINEERS

FORT WORTH, TEXAS

5/15/95

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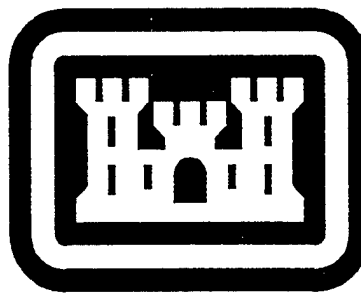
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I. EXECUTIVE SUMMARY

A. Introduction

This energy conservation study was performed by Huitt-Zollars Inc, for the U.S. Army Engineer District (USAED), Fort Worth, under contract number DACAC63-94-D-0015. The study was conducted at Red River Army Depot (RRAD) in Texarkana, Texas, between October 17, 1994 and April 14, 1995. The site survey and data collection were performed by C.A. Pieper, P.E. and Tom Luckett, Lighting Designer.

The purpose of the study was to perform a limited site survey of specific buildings at the facility, identify specific Energy Conservation Opportunities (ECOs) that exist, and then evaluate these ECOs for technical and economic feasibility. These ECOs were limited to building interior lighting and it's effects on the heating, ventilating and air conditioning (HVAC) systems.

This survey was conducted with the assistance of many individuals at the facility. Special thanks is extended to all who assisted, including the following individuals:

Ross Ramsauer, Energy Coordinator

Doyle Grider, Electrical Maintenance Supervisor

Wayne Rahea, Planner & Estimator

Any questions concerning this report should be directed to the Project Manager, C.A. Pieper, P.E., at Huitt-Zollars Inc., 512 Main Street, Suite 1500, Fort Worth, Texas 76102. Phone 817-335-3000.

B. Buildings Studied

The buildings included in this study and their total building areas are listed below:

Building 323, Vehicle Rehab	- 59,392 sqft
Building 468, School / Clinic	- 59,614 sqft
Building 15, Post Headquarters	- 31,267 sqft
Building 441, Small Arms Repair / Whs.	- 37,267 sqft
Building 133, Misc. Trade Work	- 13,654 sqft
Building 245, Maintenance Shops	- 15,827 sqft
Building 315, Vehicle Rehab	- 43,776 sqft
Building 321, Body Shop	- 123,648 sqft
Building 345, Vehicle Rebuild / Gun Shop	- 370,688 sqft
Building 421, Facility Maintenance	- 51,456 sqft

C. Present Energy Consumption

Base Year Energy Consumption: The total metered electrical and gas consumptions for 12 consecutive months, prior to this study, were obtained from the facility and are referred to as the 'base year'. These data are shown on page 8 and are summarized as follows:

Electrical 59,344 MWH

Natural Gas 156,471 MCF

Lighting Energy Consumption: The present annual lighting energy consumption (HVAC not included) for the building areas studied was calculated on page B-2 as follows:

Lighting Energy 1,932,080 KWH

3.2% of base year total

D. Energy Conservation Opportunity (ECO) Analysis

ECOs Rejected: After reviewing the data collected at the facility and considering all of the practical limitations involved, certain potential ECOs were rejected prior to performing calculations. These ECOs are summarized below with their reasons for rejection.

1. *Install Additional Switches in Large Areas, Turn Lights Off:* Most of the building areas were found to be evenly occupied during working hours, and the addition of extra switches for groups of lights in a large area would not allow lights to be turned off. Those areas that had irregular or intermittent occupancy were considered for adding occupancy sensors to turn off lights. See ECO 3 in Appendix E.
2. *Install Fluorescent Reflectors in Existing Fixtures:* This ECO requires installing the polished silver reflectors into 4 lamp fluorescent fixtures and then removing 2 lamps and a ballast. While this cuts the fixtures energy consumption in half, it also drops the lumen output from the fixture by at least 1/3, based on IES tests. Therefore, an area must be overlighted by at least 33% in order to maintain acceptable light levels. Very few areas were found that could meet this criteria.
3. *Replace Exit Signs With Low Wattage Signs:* There are many different types of exist signs at RRAD, and many are not illuminated. Because there appears to be no stringent requirement for illuminated exit signs at the facility, any uniform replacement of the existing signs with low wattage illuminated signs would likely increase the lighting energy consumption. However, all new exit sign installations should be standardized to use only low wattage LED or fluorescent types, rather than the incandescent type.
4. *Install Compact Fluorescent Lamps in Incandescent Fixtures:* These new compact fluorescent lamps can be easily replaced at a later time with inefficient incandescent lamps, therefore eliminating the benefit of any lamp retrofit project. Since the longevity of this energy conservation retrofit cannot be guaranteed, this potential ECO has been rejected.

ECOs Recommended: Certain ECOs which were identified during the building survey have been evaluated for technical and economic feasibility and are recommended for implementation. Complete documentation of all calculations as well as information required for implementation is included in Appendix D. These recommended ECOs are summarized below in order of descending Savings to Investment Ratio (SIR).

ECO 2: Replace Existing Fluorescent Lighting With Electronic Fluorescent Lighting

Electrical Energy Savings	539,071	KWH/yr
Electrical Demand Savings	2,694	KW-mo/yr
Natural Gas Energy Penalty	915.0	MMBTU/yr
Net Energy Savings	924.8	MMBTU/yr
Annual Cost Savings	30,980	\$/yr
Total Investment	206,512	\$
Simple Payback	6.6	yrs
SIR	2.21	

ECO 1: Replace Existing Incandescent And Mercury Vapor Lighting.

Electrical Energy Savings	214,901	KWH/yr
Electrical Demand Savings	1,126	KW-mo/yr
Natural Gas Energy Penalty	369.0	MMBTU/yr
Net Energy Savings	364.4	MMBTU/yr
Annual Cost Savings	18,494	\$/yr
Total Investment	165,411	\$
Simple Payback	8.9	yrs
SIR	1.65	

ECOs Not Recommended: Certain ECOs which were identified during the building survey have been evaluated for technical and economic feasibility but are not recommended for implementation. Complete documentation of all calculations are included in Appendix E. These non-recommended ECOs are summarized below in order of order of descending SIR.

ECO 3: Provide Motion Sensor Controls For Lights

Electrical Energy Savings	1,659	KWH/yr
Electrical Demand Savings	0	KW-mo/yr
Natural Gas Energy Penalty	0	MMBTU/yr
Net Energy Savings	5.6	MMBTU/yr
Annual Cost Savings	42	\$/yr
Total Investment	1,716	\$
Simple Payback	41.1	yrs
SIR	0.37	

Because of the long payback period and the low SIR, this ECO is not recommended for implementation.

ECIP Projects Developed. The facility decided not to submit any projects for ECIP funding. All projects will be submitted for funding as Non-ECIP projects.

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Non-ECIP Projects Developed. Project 1 below will be submitted by the facility for funding as a non-ECIP project. However, there is some opposition to the implementation of Project 2 within the facility staff. It has been included in this summary in case the opposition is eliminated and the staff decide to implement it in an effort to conserve energy:

Project 1: Replace Existing Incandescent And Mercury Vapor Lighting.

Electrical Energy Savings	214,901	KWH/yr
Electrical Demand Savings	1,126	KW-mo/yr
Natural Gas Energy Penalty	369.0	MMBTU/yr
Net Energy Savings	364.4	MMBTU/yr
Annual Cost Savings	18,494	\$/yr
Total Investment	165,411	\$
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Net Energy Savings	924.8	MMBTU/yr
Annual Cost Savings	30,980	\$/yr
Total Investment	206,512	\$
Simple Payback	6.6	yrs
SIR	2.21	

Recommended Maintenance & Operations Practices: The following maintenance and operations (M&O) practices are recommended to help conserve lighting energy at the RRAD.

1. The Energy Coordinator should work together with the RRAD Director of Public Works to develop a Standard Specification for all future lighting repair and renovation projects. All facility lighting designers, as well as the lighting maintenance contractors, should be required to follow this specification. The energy coordinator should review all new lighting designs to check for compliance with the specifications. This will help to eliminate the inadvertent use of inefficient lighting systems at the facility.
2. Facility lighting designers should obtain and use published design lighting levels for all lighting renovation projects or new installations. This will help to eliminate overlighting.
3. The installation of new incandescent lighting should be prohibited. More efficient sources should be used in all cases.
4. The energy coordinator should direct considerable energy conservation efforts towards the production processes using electrical energy, as this is the largest area of potential savings. See page 8, *Utility Data*, for more details.
5. The energy coordinator should attend training seminars for building energy managers, such as those listed in Appendix G, whenever possible.

E. Energy And Cost Savings

Total Potential Energy and Cost Savings. The calculated energy and cost savings from the implementation of both projects is as follows:

Electrical Energy Savings	753,972	KWH/yr
Electrical Demand Savings	3,820	KW-mo/yr
Natural Gas Energy Penalty	1,284	MMBTU/yr
Total Energy Savings	1,289	MMBTU/yr
Total Cost Savings	49,474	\$/yr
Total Investment	371,923	\$
Simple Payback	7.5	yrs

Energy Use and Costs Before and After. Based on the base year electrical and gas energy consumptions and costs shown on page 8, and the calculated total potential savings above, the RRAD energy and usage and costs before and after implementation of the two Non-ECIP projects is as follows:

	<u>Before</u>	<u>After</u>
Electrical	59.344 MWH	58.590 MWH
Natural Gas	156,471 MCF	157,755 MCF
Total Cost	2,943,671 \$	2,894,197 \$

Percentage Saved. Based on the base year electrical and gas energy consumptions and costs, the percentage of savings from the two projects is as follows:

$$\text{Electrical Energy Saved} = \left[\frac{0.753 \text{ MWH}}{59.344 \text{ MWH}} \right] = 1.3\%$$

$$\text{Gas Energy Penalty} = \left[\frac{1,284 \text{ MCF}}{156,471 \text{ MCF}} \right] = 0.8\%$$

$$\text{Energy Cost Savings} = \left[\frac{49,474 \$}{2,943,671 \$} \right] = 1.7\%$$